

US10575505 revised
SEQUENCE LISTING

<110> Helmholtz-Institut fuer Infektionsforschung GmbH
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Chernikova, Tatjana
Golyshin, Peter
Timmis, Kenneth
Yakimov, Michail

<120> Transgenic organisms with lower growth temperatures

<130> FERRER ET AL-1

<150> EP 03023032.0

<151> 2003-10-13

<160> 28

<170> PatentIn version 3.5

<210> 1

<211> 97

<212> PRT

<213> artificial sequence

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<223> Cpn10 of Oleispira antarctica

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Glu Lys Pro Asn Gln Gly Val Val Ile Ser Val Gly Thr Gly Arg Ile
35 40 45

Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val
50 55 60

Val Val Phe Gly Lys Tyr Ser Gly Gln Asn Thr Ile Asp Ile Asp Gly
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<213> artificial sequence

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35 40 45

Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp
50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg
145 150 155 160

Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr
165 170 175

Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly
180 185 190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln
195 200 205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp
210 215 220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val
225 230 235 240

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Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly
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Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys
260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met
275 280 285

Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu
290 295 300

Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala
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Ser Lys Val Val Ile Asp Lys Glu Asn Thr Val Ile Val Asp Gly Ala
325 330 335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu
340 345 350

Ile Glu Ser Ser Thr Ser Asp Tyr Asp Ile Glu Lys Leu Gln Glu Arg
355 360 365

Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly
370 375 380

Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu
385 390 395 400

His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly
405 410 415

Val Ala Leu Ile Arg Ala Leu Ser Ser Val Thr Val Val Gly Asp Asn
420 425 430

Glu Asp Gln Asn Val Gly Ile Ala Leu Ala Leu Arg Ala Met Glu Ala
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Pro Ile Arg Gln Ile Ala Gly Asn Ala Gly Ala Glu Gly Ser Val Val
450 455 460

Val Asp Lys Val Lys Ser Gly Thr Gly Ser Phe Gly Phe Asn Ala Ser
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Thr Gly Glu Tyr Gly Asp Met Ile Ala Met Gly Ile Leu Asp Pro Ala
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485

495

Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu
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Met Ile Thr Thr Glu Ala Met Val Ala Asp Ala Pro Val Glu Glu Gly
515 520 525

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Pro Gly Met Met
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<213> Oleispira antarctica

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 <213> Oleispira antarctica

<400> 4

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Thr Thr Gln Gln Asp Asn Leu Tyr Thr Gly Val Met Ser Leu Ala Arg
35 40 45

Asp Ser Ala Gly Leu Glu Val Lys Thr Ala Ser Ala Gly Asp Val Asn
50 55 60

Leu Thr Tyr Met Glu Arg Gln Gly Ser Asp Lys Asp Asn Ala Glu Ser
65 70 75 80

Val Ile Leu Leu His Gly Phe Ser Ala Asp Lys Asp Asn Trp Ile Leu
85 90 95

Phe Thr Lys Glu Phe Asp Glu Lys Tyr His Val Ile Ala Val Asp Leu
100 105 110

Ala Gly His Gly Asp Ser Glu Gln Leu Leu Thr Thr Asp Tyr Gly Leu
115 120 125

Ile Lys Gln Ala Glu Arg Leu Asp Ile Phe Leu Ser Gly Leu Gly Val
130 135 140

Asn Ser Phe His Ile Ala Gly Asn Ser Met Gly Gly Ala Ile Ser Ala
145 150 155 160

Ile Tyr Ser Leu Ser His Pro Glu Lys Val Lys Ser Leu Thr Leu Ile
165 170 175

Asp Ala Ala Gly Val Asp Gly Asp Thr Glu Ser Glu Tyr Tyr Lys Val
180 185 190

Leu Ala Glu Gly Lys Asn Pro Leu Ile Ala Thr Asp Glu Ala Ser Phe
195 200 205

Glu Tyr Arg Met Gly Phe Thr Met Thr Gln Pro Pro Phe Leu Pro Trp
210 215 220

Pro Leu Arg Pro Ser Leu Leu Arg Lys Thr Leu Ala Arg Ala Glu Ile
225 230 235 240

Asn Asn Lys Ile Phe Ser Asp Met Leu Lys Thr Lys Glu Arg Leu Gly
245 250 255

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Met Thr Asn Phe Gln Gln Lys Ile Glu Val Lys Met Ala Gln His Pro
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Leu Pro Thr Leu Ile Met Trp Gly Lys Glu Asp Arg Val Leu Asp Val
275 280 285

Ser Ala Ala Ala Ala Phe Lys Lys Ile Ile Pro Gln Ala Thr Val His
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Oleispira antarctica

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Glu	Lys	Pro	Asn	Gln	Gly	Val	Val	Ile	Ser	Val	Gly	Thr	Gly	Arg	Ile
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Leu	Asp	Asn	Gly	Ser	Val	Gln	Ala	Leu	Ala	Val	Asn	Glu	Gly	Asp	Val
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35 40 45

Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp
50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg
145 150 155 160

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Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr
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Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly
180 185 190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln
195 200 205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp
210 215 220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val
225 230 235 240

Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly
245 250 255

Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys
260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met
275 280 285

Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu
290 295 300

Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala
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325 330 335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu
340 345 350

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Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly
370 375 380

Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu
385 390 395 400

His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly
405 410 415

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Val Ala Leu Ile Arg Ala Leu Ser Ser Val Thr Val Val Gly Asp Asn
420 425 430

Glu Asp Gln Asn Val Gly Ile Ala Leu Ala Leu Arg Ala Met Glu Ala
435 440 445

Pro Ile Arg Gln Ile Ala Gly Asn Ala Gly Ala Glu Gly Ser Val Val
450 455 460

Val Asp Lys Val Lys Ser Gly Thr Gly Ser Phe Gly Phe Asn Ala Ser
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Thr Gly Glu Tyr Gly Asp Met Ile Ala Met Gly Ile Leu Asp Pro Ala
485 490 495

Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu
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Pro Gly Met Met
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50 55 60

Leu Thr Tyr Met Glu Arg Gln Gly Ser Asp Lys Asp Asn Ala Glu Ser
65 70 75 80

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Val Ile Leu Leu His Gly Phe Ser Ala Asp Lys Asp Asn Trp Ile Leu
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Phe Thr Lys Glu Phe Asp Glu Lys Tyr His Val Ile Ala Val Asp Leu
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Ala Gly His Gly Asp Ser Glu Gln Leu Leu Thr Thr Asp Tyr Gly Leu
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Asn Ser Phe His Ile Ala Gly Asn Ser Met Gly Gly Ala Ile Ser Ala
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Ile Tyr Ser Leu Ser His Pro Glu Lys Val Lys Ser Leu Thr Leu Ile
165 170 175

Asp Ala Ala Gly Val Asp Gly Asp Thr Glu Ser Glu Tyr Tyr Lys Val
180 185 190

Leu Ala Glu Gly Lys Asn Pro Leu Ile Ala Thr Asp Glu Ala Ser Phe
195 200 205

Glu Tyr Arg Met Gly Phe Thr Met Thr Gln Pro Pro Phe Leu Pro Trp
210 215 220

Pro Leu Arg Pro Ser Leu Leu Arg Lys Thr Leu Ala Arg Ala Glu Ile
225 230 235 240

Asn Asn Lys Ile Phe Ser Asp Met Leu Lys Thr Lys Glu Arg Leu Gly
245 250 255

Met Thr Asn Phe Gln Gln Lys Ile Glu Val Lys Met Ala Gln His Pro
260 265 270

Leu Pro Thr Leu Ile Met Trp Gly Lys Glu Asp Arg Val Leu Asp Val
275 280 285

Ser Ala Ala Ala Ala Phe Lys Lys Ile Ile Pro Gln Ala Thr Val His
290 295 300

Ile Phe Pro Glu Val Gly His Leu Pro Met Val Glu Ile Pro Ser Glu
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Ser Ala Lys Val Tyr Glu Glu Phe Leu Ser Ser Ile Lys
Page 13

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Oleispira antarctica

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Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val
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Pro Lys Gly Arg Asn Val Val Ile Glu Lys Ser Phe Gly Ala Pro Ile
 35 40 45

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Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp
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Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln
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Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn
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Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp
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Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val
225 230 235 240

Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly
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Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys
260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met
275 280 285

Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu
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290

295

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325 330 335

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 <223> Cpn10 of oleispira antarctica, nucleotides 458 - 751

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 1 5 10 15

Glu Glu Thr Ala Thr Ala Gly Gly Ile Ile Leu Pro Gly Ala Ala Ala
 20 25 30

Glu Lys Pro Asn Gln Gly Val Val Ile Ser Val Gly Thr Gly Arg Ile
 35 40 45

Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val
 50 55 60

Val Val Phe Gly Lys Tyr Ser Gly Gln Asn Thr Ile Asp Ile Asp Gly
 65 70 75 80

Glu Glu Leu Leu Ile Leu Asn Glu Ser Asp Ile Tyr Gly Val Leu Glu
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Ala

<210> 15

<211> 548

<212> PRT

<213> artificial sequence

<220>

<223> Cpn60 of oleispira antarctica, nucleotides 458 - 751

<400> 15

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Leu Val Gly Val Asn Ile Leu Ala Asp Ala Val Arg Val Thr Leu Gly
20 25 30

Pro Lys Gly Arg Asn Val Val Ile Glu Lys Ser Phe Gly Ala Pro Ile
35 40 45

Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp
50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg
145 150 155 160

Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr
165 170 175

Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly
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180 185 190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln
195 200 205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp
210 215 220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val
225 230 235 240

Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly
245 250 255

Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys
260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met
275 280 285

Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu
290 295 300

Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala
305 310 315 320

Ser Lys Val Val Ile Asp Lys Glu Asn Thr Val Ile Val Asp Gly Ala
325 330 335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu
340 345 350

Ile Glu Ser Ser Thr Ser Asp Tyr Asp Ile Glu Lys Leu Gln Glu Arg
355 360 365

Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly
370 375 380

Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu
385 390 395 400

His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly
405 410 415

Val Ala Leu Ile Arg Ala Leu Ser Ser Val Thr Val Val Gly Asp Asn
420 425 430

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Glu Asp Gln Asn Val Gly Ile Ala Leu Ala Leu Arg Ala Met Glu Ala
435 440 445

Pro Ile Arg Gln Ile Ala Gly Asn Ala Gly Ala Ala Gly Ala Ala Val
450 455 460

Val Asp Lys Val Lys Ser Gly Thr Gly Ser Phe Gly Phe Asn Ala Ser
465 470 475 480

Thr Gly Glu Tyr Gly Asp Met Ile Ala Met Gly Ile Leu Asp Pro Ala
485 490 495

Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu
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Met Ile Thr Thr Glu Ala Met Val Ala Asp Ala Pro Val Glu Glu Gly
515 520 525

Ala Gly Gly Met Pro Asp Met Gly Gly Met Gly Gly Met Gly Gly Met
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Pro Gly Met Met
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<211> 2783
<212> DNA
<213> artificial sequence

<220>
<223> coding sequence encoding mutant protein

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<220>
 <223> Forward Primer

<220>
 <221> misc_feature
 <222> (1)..(22)
 <223> "n" defines inosine

<400> 17	
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<210> 18
 <211> 23
 <212> DNA
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<220>
 <223> Reverse Primer

<220>
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 <222> (1)..(23)
 <223> residue "n" designates inosine

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<210> 19
 <211> 13
 <212> PRT
 <213> Oleispira antarctica

<400> 19	
Ser Val Ala Ala Gly Met Asn Pro Met Asp Leu Gln Arg	
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<210> 20
 <211> 16
 <212> PRT
 <213> Oleispira antarctica

<400> 20

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Val Glu Glu Gly Val Val Ala Gly Gly Gly Val Ala Ala Leu Leu Arg
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<220>
 <223> oligonucleotide

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<220>
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<400> 22
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<220>
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<210> 24
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<220>
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<400> 24
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<210> 26
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<210> 27
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<400> 27
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<210> 28
 <211> 42
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<220>
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<400> 28
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